NON-PUBLIC?: N
ACCESSION #: 8904060007
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Pilgrim Nuclear Power Station PAGE: 1 OF 5

DOCKET NUMBER: 05000293

TITLE: Automatic Closing of the Main Steam Isolation Valves and Subsequent Reactor Scram Due to Automatic Cycling of the Turbine Bypass Valves
EVENT DATE: 03/04/89 LER #: 89-011-00 REPORT DATE: 03/31/89

OPERATING MODE: N POWER LEVEL: 010

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
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Senior Compliance Engineer TELEPHONE: (508) 747-8160

COMPONENT FAILURE DESCRIPTION:
CAUSE: X SYSTEM: SB COMPONENT: PDT MANUFACTURER: R369
REPORTABLE TO NPRDS: Y

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On March 4, 1989 at 1749 hours, an automatic actuation of a portion of the Primary Containment Isolation Control System (PCIS) and the Reactor Protection System (RPS) occurred during Turbine-Generator (T-G) coastdown. Previously, the T-G was manually tripped due to vibration indications of two bearings. The PCIS actuation included the automatic closing of the Main Steam Isolation Valves (MSIVs). The RPS actuation and reactor scram occurred as designed because the MSIVs were closing.

The PCIS actuation occurred because the Main Steam System/Reactor Vessel (RV) low pressure trip setpoint (900 psig) was reached while the reactor mode selector switch was in the RUN position. The pressure decrease was due to the automatic closing and re-opening of the Turbine Bypass Valves that occurred because of a bypass valves vacuum trip and an unexplained reset of the vacuum trip. The cause for the vacuum trip and reset of the trip could not be determined during extensive investigation. Subsequent controlled testing, attempting to duplicate the March 4, 1989 conditions, was performed with

satisfactory results. Unrelated to the cause for the event was the failure (spurious upscale trip) of a differential pressure transmitter (Rosemount Incorporated model 1153 DB7RCN0012) that was replaced and sent to the manufacturer for examination.

This event occurred when the reactor power level was 10 percent. The control rods inserted automatically. The RV water temperature was 537 degrees Fahrenheit and the RV pressure was 930 psig just prior to the event. This report is submitted in accordance with 10 CFR 50.73(a)(2)(iv). This event posed no threat to the health and safety of the public.

END OF ABSTRACT

EVENT DESCRIPTION

On March 4, 1989 at 1749 hours, an automatic actuation of the Main Steam System/Group 1 (one) portion of the Primary Containment Isolation Control System (PCIS) occurred. The actuation was the result of low Reactor Vessel pressure (900 psig) that occurred while the reactor mode selector switch was in the RUN position.

The actuation resulted in the following responses. The inboard and outboard Primary Containment System Group 1 (one) isolation valves, including the Main Steam Isolation Valves (MSIVs), closed automatically. An automatic Reactor Protection System (RPS) scram signal occurred as designed because the MSIVs were closing (i.e., less than 90 percent open). The scram signal resulted in the automatic insertion of the control rods that were in a partially withdrawn position.

Failure and Malfunction Report 89-107 was written to document the event. The NRC Operations Center was notified on March 4, 1989 at 1922 hours.

Prior to the PCIS/RPS actuation, the following March 4, 1989 events occurred:

At 1630 hours, the Turbine-Generator (T-G) was manually tripped because of vibration indications for two T-G bearings (numbers three and four). The T-G was rotating at approximately 1800 rpm.

At 1738 hours, a Reactor Control Panel C-905R alarm, "Main Steamline Channel A High Flow", occurred that could not be reset. Failure and Malfunction Report 89-110 was written to document the problem.

The Reactor Vessel (RV) water temperature was approximately 537 degrees Fahrenheit and the RV pressure was approximately 930 psig just prior to the

event. The Main Condenser vacuum was approximately 29.90 inches of mercury. The reactor power level was approximately 10 percent. The Main Steam System/RV pressure was being controlled by the Electric Pressure Regulator. One and one-half Turbine Bypass Valves were open just prior to the event.

CAUSE

A post trip review was conducted in accordance with Procedure 1.3.37 (Rev. 4), "Post Trip Reviews". The review revealed that at 1748 hours (approximately 30 seconds prior to the PCIS/RPS actuation) a Turbine Bypass Valves low vacuum trip (VT-2) followed by a Main Condenser low vacuum trip (VT-1) had occurred. Failure and Malfunction Report 89-108 was written to document the vacuum trips and an unexplained reset of the trips.

Because the reason for the vacuum trips and resets of the trips could not be determined by the post trip review team, a second multi-discipline team was formed. This team, using Kepner-Tregoe (K-T) techniques for the investigation, could not identify the cause for the vacuum trips (VT-1 or VT-2) or the resets.

The cause for the PCIS Group 1 (one) actuation, and resulting RPS scram signal, was a decrease in RV pressure to less than 900 psig while the reactor mode selector switch (RMSS) was in the RUN position. The PCIS/RPS actuation was the designed response to the decrease in RV pressure (900 psig) while the RMSS was in the RUN position.

The RV pressure fluctuation was caused by the automatic closing of the Turbine Bypass Valves that was followed by the automatic opening of the valves. The bypass valves closed because of the Turbine Bypass Valves low vacuum trip signal (VT-2). The trip signal occurred even though the Main Condenser vacuum was steady (at approximately 29.90 inches of mercury) and below the bypass valves low vacuum trip setpoint (7.8 inches of mercury decreasing). The closing of the bypass valves, in conjunction with the other Turbine valves that were already in the closed position, resulted in an increase in Main Steam System/RV pressure to approximately 1023 psig. Approximately 10 seconds after the vacuum trip, the bypass valves vacuum trip (VT-2) reset and the bypass valves opened. The opening of the bypass valves re-established a steam flowpath to the Main Condenser. The resulting increase in Main Steam System flow caused a decrease in RV/Main Steam System pressure past the low RV pressure setpoint (900 psig) that in conjunction with the RMSS in the RUN position, resulted in the event.

The vacuum trips (VT-1 and VT-2) should not have reset without licensed operator action. The Main Condenser low vacuum trip (VT-1) and the Turbine

Bypass Valves low vacuum trip (VT-2) can only be reset manually from the Control Room (remote manual) or at the Turbine front standard. The licensed operators in the Control Room at the time of the event reported that the trips were not manually reset. Moreover, workers within view of the Turbine front standard reported no personnel in the vicinity at the time of the event.

The Main Condenser low vacuum trip (i.e., VT-1) signal also occurred even though the Main Condenser vacuum was steady (at approximately 29.90 inches of mercury) and below the Main Condenser low vacuum trip setpoint (22.4 inches of

ercury decreasing). The trip signal (VT-1) affects the position of the Turbine stop valves, the control valves located upstream of the high pressure Turbine, and the combined intermediate valves located between the high pressure Turbine and the low pressure Turbine. All of these valves were in the closed position prior to the trip signal because of the previous manual trip of the T-G, and all of these valves remained in the closed position.

The cause for the alarm, "Main Steamline Channel A High Flow", was a spurious upscale trip signal generated by a differential pressure transmitter (DPT-261-2N). This (flow sensing) transmitter is one of 16 transmitters that function to monitor Main Steam System flow and output a trip signal if a high system flow occurs. Post trip review of appropriate data and instrumentation recorders revealed that a high Main Steam System flow did not occur and that no plant evolution or surveillance activity in progress caused the trip signal. The as-found transmitter remained in the tripped condition and could not be calibrated satisfactorily. The transmitter, together with its amplifier and calibration cards, was replaced and sent to the manufacturer for examination. The transmitter was manufactured by Rosemount Incorporated, and is a model number 1153 DB7RCN0012, serial number 418336.

CORRECTIVE ACTION

In addition to the post trip review and extensive K-T investigation, the following actions were also taken:

The Electric Pressure Regulator (EPR) and Mechanical Pressure Regulator (MPR) of the Turbine Supervisory Control System were checked. The calibration of the EPR and MPR, and the lead/lag and response time checks of the EPR were all satisfactory as-found.

The instrumentation cabling for the vacuum trips (VT-1 and VT-2) from the Control Room to the Turbine front standard were visually inspected with satisfactory results. The cabling was also checked electrically (meggered and rung down) with satisfactory results.

The vacuum trip(s) mechanical linkages were visually inspected and tested with satisfactory results.

The vacuum trip(s) sensing bellows were checked with satisfactory results. The instrumentation cabling from the trip sensors to the Turbine hydraulic control trip solenoid valves were checked with satisfactory results. The solenoid valves were checked with satisfactory results.

The Turbine Bypass Valves hydraulic system was checked with satisfactory results.

A controlled test, attempting to duplicate the March 4, 1989 conditions, was performed with satisfactory results on March 12, 1989. The test was performed in accordance with procedure TP 89-18, "Monitoring Turbine Trip Parameters", and with a video recording system located at the Turbine front standard. None of the events experienced on March 4, 1989 occurred during the test.

SAFETY CONSEQUENCES

This event posed no threat to the health and safety to the public.

The system(s) responses described in this report have been previously analyzed in the Update Final Safety Analysis Report. The closing of the Turbine Bypass Valves resulted in a RV pressure increase to approximately 1023 psig. The pressure was less than the high RV pressure setpoint (1065 psig).

If the pressure had increased to the setpoint, automatic high RV pressure trip signals would be generated from redundant safety grade pressure sensors to the Reactor Protection System (RPS) and to the redundant (diverse) Anticipated Transient Without Scram (ATWS) System. Each of these systems (RPS and ATWS) are designed to result in the automatic insertion of the control rods into the Reactor Vessel and thereby eliminate reactor power generation and any further increase in RV pressure. In addition, the Pressure Relief System provides automatic pressure protection for the Reactor Vessel.

If the Main Condenser low vacuum trip (VT-1) had occurred while Main Steam System flow was being supplied to the Turbine, the automatic closing of the related Turbine valves could have resulted in a similar increase in Main Steam System/RV pressure. The closing of the Turbine stop valves or control valves would generate a trip signal(s) to the RPS for the automatic insertion of the control rods

into the Reactor Vessel.

This report is submitted in accordance with 10 CFR 50.73(a)(2)(iv) because the PCIS and RPS logic circuitry were actuated.

SIMILARITY TO PREVIOUS EVENTS

A review was conducted of Pilgrim Station Licensee Event Reports (LERs) submitted since January 1984. The review was focused to LERs submitted in accordance with 10 CFR 50.73(a)(2)(iv) involving: Turbine-Generator bearing vibration, or Turbine valves (stop valves, control valves, combined intermediate valves, bypass valves), or Main Condenser low vacuum.

The review identified a bearing vibration detector problem that was reported in LER 50-293/84-015-00. For that event, the detection of high vibration for one Turbine-Generator bearing (number nine) resulted in a generator trip signal, a load reject trip signal, and a reactor scram at 85 percent reactor power. The cause was damage at the tip of the vibration detector for the bearing. The damage was the result of a blocked lube oil orifice that supplies lubrication at the interface of the vibration detector tip and the main shaft (exciter end) of the Turbine-Generator.

ENERGY INDUSTRY IDENTIFICATION SYSTEM (EIIS) CODES

The EIIS codes for this report are as follows:

COMPONENTS CODES

Bellows BLL
Control, Pressure (EPR) PC
Transmitter, Differential, Pressure (DPT-261-2N) PDT
Valve, Control, Pressure (Bypass Valves) PCV
Valve, Isolation (MSIVs) ISV

SYSTEMS

Condenser Vacuum System SH
Containment Isolation Control System (PCIS) JM
Engineered Safety Features Actuation System (PCIS/RPS) JE
Main Steam System SB
Main Turbine System TA
Main Turbine Instrumentation System IT
Plant Protection System (RPS) JC
Turbine Steam Bypass Control System (EPR/MPR) JI
Turbine Supervisory Control System JJ

10 CFR 50.73

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Ralph G. Bird
Senior Vice President - Nuclear March 31, 1989
BECo Ltr 89-046

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555

Docket No. 50-293
License No. DPR-35

Dear Sir:

The attached Licensee Event Report (LER) 89-011-00, "Automatic Closing of the Main Steam Isolation Valves and Subsequent Reactor Scram Due to Automatic Cycling of the Turbine Bypass Valves" is submitted in accordance with 10 CFR Part 50.73.

Please do not hesitate to contact me if there are any questions regarding this report.

R. G. Bird

DWE/bjh

Enclosure: LER 89-011-00

cc: Mr. William Russell
Regional Administrator, Region I
U.S. Nuclear Regulatory Commission
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Sr. NRC Resident Inspector - Pilgrim Station

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